ELECTION OF OFFICERS.

The following officers were elected for the ensuing year: President, Dr. E. D. Fisher; Vice-President, Dr. C. A. Herter; 2d Vice-President, Dr. Wm. M. Leszynsky; Recording Secretary, Dr. Frederick Peterson; Corresponding Secretary, Dr. Mary Putnam-Jacobi; Treasurer, Dr. G. M. Hammond.

PHILADELPHIA NEUROLOGICAL SOCIETY.

Stated Meeting, March 26th, 1894.

Vice-president, Dr. JAMES HENDRIE LLOYD, in the chair.

Dr. M. ALLEN STARR, of New York, read a paper on

LOCAL ANÆSTHESIA AND OTHER SYMPTOMS PRODUCED BY LESIONS OF THE CERVICAL CORD.

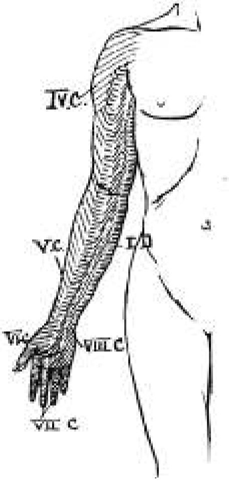
ABSTRACT.

AFTER alluding to the relations between the various segments of the cervical cord and the spines and bodies of the cervical vertebræ, and showing that the relation is a variable one, the author proceeded to cite a number of cases of limited lesion of the cervical cord, traumatic, hemorrhagic, inflammatory and due to tumor, in which the local symptoms had been exactly studied, and in which the anæsthesia present had been carefully laid down on diagrams.

He then drew the following conclusions:

CONCLUSIONS.

First. As to the distribution of anæsthesia in lesions of the cervical enlargement of the spinal cord. By combining the diagrams already given with numerous other diagrams published by Thorburn and others, and comparing the results with descriptions of numerous cases collected by Mills and Lloyd, by Chipault, White and other surgeons, it is possible to produce a schematic diagram, such as is here presented, demonstrating the areas of skin upon the arm which are related to the various segments of the cord between the second dorsal and the fourth cervical.



1. The first area is a narrow one upon the inner side of the arm and forearm, extending down to the wrist, but not involving the hand. This includes a small zone both upon the dorsal and palmar surfaces of the arm and forearm, but is quite narrow. While it is probable that the upper portion of this area in the axilla is related to the second dorsal nerve, as Head maintains, I can find no exact lesion of the cord limited to the second dorsal segment and associated with such a limited anæsthesia to prove this statement.

There is a case reported by Charcot,[1] in which a bullet wound involved the first dorsal nerve only, and in which a small area in the axilla remained sensitive; the other parts included in area number one being anæsthetic, but as no examination of the cord was made in this case the conclusion drawn from it is of no more weight than that which might be drawn from a knowledge of the anatomy of the intercostal-humeral nerve. Area number one corresponds to the first dorsal segment.

2. The second area includes the ulnar side of the

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[1] Arch. de Neurol., 1891.

hand, both palmar and dorsal surfaces, the little finger and one-half of the ring finger. It also includes a narrow strip of the skin upon the dorsal and palmar surfaces of the forearm and arm up to the axilla. This is proven by the fact that when lesions invade the eighth cervical segment of the cord the zone of anæsthesia upon the front and back of the arm and forearm is decidedly wider than when the first area alone is anæsthetic. It affords also a confirmation of the statements of Sherrington that there are no isolated patches of skin entirely separated from the body related to the sensory nerves. The second zone corresponds to the eighth cervical segment.

3. The third zone extends to the middle line of the middle finger, includes the middle of the palm and back of the hand and runs up the centre of the forearm and arm on both surfaces. This corresponds to the seventh cervical segment.

4. The fourth zone includes the remaining skin of the fingers and thumb and of the hand as high as the wrist and a narrow strip of skin up the forearm and arm on both surfaces to the axilla. This corresponds to the sixth cervical segment.

5. The fifth zone includes the skin upon the outer side of the forearm and arm on both surfaces as high as the insertion of the deltoid muscle. This corresponds to the fifth cervical segment.

6. The facts that in lesions as high as the fifth segment there occasionally occurs hyperæsthesia over the top of the shoulder and in the region of the supraclavicular nerves, and that in pachymeningitis the pain is felt here, leads to the belief that the fourth segment is in relation with this area. But in as much as lesions of the fourth segment of a destructive nature are uniformly fatal no case of anæsthesia can be found to determine the exact extent of skin which corresponds respectively to the fourth and third cervical segments.

It is hardly necessary to point out the differences between the areas of anæsthesia produced by cord lesions and those produced by lesions of individual nerve trunks, although a glance at the diagram and its comparison with Flower's well known plates shows this immediately. It is also evident that a study of the anæsthesia occurring in spinal cord lesions and that occurring in multiple neuritis, affords an important point of diagnosis between these two conditions. It will be remembered that in multiple neuritis, the anæsthesia affects all the fingers simultaneously, then the entire hand and then extends up the arm involving all surfaces on both sides in an area which has been aptly described as the "glove area," corresponding, as it does, to the region of skin covered by a glove of various lengths. I have never seen a case of multiple neuritis in which the anæsthesia extended as high as into the axilla. It is usually limited by a line drawn around the elbow or a line in the middle of the arm.

Lastly, the area of anæsthesia occurring in hysterical conditions is different from that described as occurring in spinal lesions, for there is never the patch of normal sensitive skin over the top of the shoulder and down the outer side of the arm to the insertion of the deltoid, such as we have seen in all the cases of spinal lesions, and in hysterical anæsthesia it is well known that the neck is usually anæsthetic.

Clinical observers in the future should attempt by the aid of diagrams to define a little more exactly the region of the anæsthesia in the arm, and should also seek for a narrow zone of hyperæsthesia bordering the normal skin and between it and the insensitive region, which zone will necessarily be very narrow in the upper extremity. Herter is the only one who has described such a zone. In discussing the anæsthesia from lumbar lesions, I was able to show that such a zone of hyperæsthesia often existed of a most irregular shape in unexpected areas, which were easily explained when the exact region of the skin, corresponding to the segment just above the lesion was determined.

Secondly. Lesions in the lower cervical region of the cord produce a number of symptoms due to a lesion of the cilio-spinal centre which have been frequently overlooked by observers. The situation of this centre is in the first dorsal segment of the cord, and according to Klumpe[2] the symptoms are only produced by a lesion of the cord or of its nerve roots not by a lesion of the nerves after they have issued from the spinal canal and formed the brachial plexus.

The symptoms alluded to are myosis with sluggish reaction of the pupil both to light and in accommodation, a decided narrowing of the palpebral fissure so that the eye-ball looks smaller than normal and a slight retraction of the eye-ball. There is no flattening of the face, nor are there any vasomotor symptoms such as may be produced by a lesion in the course of the cervical sympathetic nerve. These symptoms are very easily overlooked if they are present upon both sides. But when the lesion has been unilateral they have been noted by a number of observers.

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[2] Klumpe. Paralysis Radiculaires. *Rev. de Med.*, 1885, Nos. 7 and 9.

Kraus[3] has described them in a number of cases of traumatic injury of the cervical cord due to fracture of the seventh cervical vertebra.

In a case of unilateral compression of the cord by a fracture of the seventh vertebra which I recently saw with Dr. Bryant at St. Vincent's Hospital, these symptoms were very noticeable upon the left side. I believe with Kraus that a more careful observation will reveal the existence of these symptoms on both sides in all cases of a crush of the lower part of the cervical and upper dorsal region of the spinal cord.

Thirdly. A careful study of the cases here collected furnishes additional evidence in regard to the localization of the motor functions of the spinal cord. They serve to confirm quite fully statements made by me in 1884 and again in 1888 in regard to the representation of the various muscles of the upper extremities in different segments of the cervical region.

In the articles alluded to, it will be found that every muscle is assigned a representation in more than one segment of the cord, and this fact has been accepted by Mills and by Kaiser. It is well known that the groups of cells in the anterior horns of the cord have a considerable extent vertically, so that some groups are long enough to reach through two, or even three segments, and but very few groups can be said to be situated in one segment only. But in as much as these groups of cells govern individual muscles, as we must believe in view of the facts known regarding anterior poliomyelitis, it is evidently a mistake to assign the representation of single muscles to single segments. I cannot, therefore, adopt the arrangement proposed by Thorburn and copied by Collins in which individual muscles are assigned to single segments.

If cases such as these here collected are carefully studied it will be found that a lesion limited to one segment rarely paralyzes any muscle completely. If, however, the lesion extends through two or more segments the paralysis is complete. Or if a lesion is a progressive one extending either upward or downward it will be found that the muscles will be paralyzed in greater and greater degree as the lesion extends. These facts are only to be explained upon the theory that individual muscles have a considerable vertical representation in the cord, and this, as we have already seen, corresponds to the anatomy of the groups of cells. The table already published, therefore, presents the facts in an accurate manner.

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[3] Kraus. *Zeitschrift für Klin. Med.*, XVIII.

I am quite prepared to admit that the vertical extent of individual groups of cells may vary in different individuals, thus in two cases carefully studied by Beevor and by Johnson the lesion though involving the sixth cervical segment caused no paralysis of the biceps, while on the other hand, in one of Herter's cases the biceps were decidedly involved by a lesion of the seventh segment. It is, therefore, probable that the representations of muscles are not always the same in different cords. The table, however, may be considered as fairly accurate because it combines a large number of facts derived from the study of very many cases. It is, perhaps, more accurate than the earlier tables. In recent cases care has been taken to examine the paralyzed muscles electrically and the existence of the reaction of the degeneration is certainly a positive proof that the group of cells governing the muscle has been destroyed.

In conclusion, I think it may be stated that the sensory and motor functions of the cervical region are now as well determined as those of the lumbo sacral region of the spinal cord.

Dr. LLOYD read a paper on

TRAUMATIC AFFECTIONS OF THE CERVICAL REGION OF THE SPINAL CORD SIMULATING SYRINGOMYELIA.

DISCUSSION.

Dr. WILLIAM OSLER, of Baltimore.—It is extremely interesting to note that these observations which enable us to localize lesions of the cord so accurately, come from the surgeon, the clinical physician, and the experimental physiologist. With reference to the ciliospinal centre, while we see myosis in spinal lesions, it is most frequent, perhaps, in aneurism pressing on the cervical sympathetic, in which it is by no means uncommon to see preliminary dilatation and the subsequent development of myosis, which persists on the affected side. All the features of paralysis of the cervical sympathetic may not be present together; thus, we not infrequently see myosis without narrowing of the palpebral orifice, or retraction of the bulb. Dr. Osler then referred to a case of pressure on the cervical sympathetic due to a tumor secondary to epithelioma of the leg.

Dr. CHARLES K. MILLS.—This paper adds one more contribution of a valuable character to assist us in the work of exact diagnosis.

In speaking of segmental localization, Dr. Starr referred to the spinal representation of muscles. I believe that a better expression for the cord as well as for the brain is the "representation of movements." This helps us to simplify and to render exact our method of looking at this matter. The same is true with reference to sensory representation in the cord. It is a representation of areas in the skin,not of nerves. Indeed this has been indicated by all that has been said to-night.

This question of segmental spinal localization has, as we all know, been applied to the explanation of functional diseases, particularly by Head, and this is one of the most interesting matters in connection with the subject. I had hoped that Dr. Starr would have referred to this. Head takes herpes zoster to give him an objective method of demonstrating his points. He holds that we have in the eruption of this affection, segmental localization, and not as has been commonly taught, merely nerve representation; and he believes that many functional affections have areas of cutaneous hyperæsthesia which he attempts to show correspond very closely with the areas of skin in herpes, and that these represent the segments of the cord affected. This is carrying studies of this kind a step further in a very interesting direction. If the observations are correct, they will perhaps throw new light upon our views with reference to certain trau-matisms of the spinal cord, and will help us in our studies of hysteria.

With reference to Brown-Sequard paralysis, I do not think that the position cited by Dr. Lloyd with approval, can be sustained. The sensory decussation in the cord is cellular, rather than a mere fibrous decussation, as was formerly held. The view now is that the transmission of nerve impulses is by cells—by contact of cells and thin processes—and not by continuity of fibres. This being the case, as I pointed out several years ago in an editorial article in the *Medical News*, the destruction of the spinal decussation by the lesions of syringomyelia, will account for the sensory phenomena.

The correct view according to the most recent investigations, would seem to be, that the decussations of the fibres which constitute the great sensory pathways for the forms of so-called common sensibility—touch, pain, temperature, etc.—take place in the cord and the oblongata in two ways: (1) by crossings in the spinal commissures at all levels of Golgi's commissural cells conveying the pathic and temperature impulses to Gowers's ascending antero-lateral tract; (2) by the crossing in block or mass of the tactile sensory tracts of the columns of Goll and Burdach, just above the cuneate and clavate nuclei at the so-called decussation of the fillet or upper sensory decussation. From this level upwards all the fasciculi for common sensibility pass cephalward together. According to this view, irregular sensory phenomena might arise in cases of peculiarly distributed unilateral lesions of the spinal cord—tactile and motor loss for instance, being shown on the side of the lesion, and impairment of the pain and temperature sense on the other side.

Dr. Francis X. Dercum.—With reference to the point in regard to the association of flacid palsies with exaggeration of the knee-jerk, we are reminded of the type of spinal syphilis which has been isolated by Erb, in which there is this flacid paralysis without a spastic condition and yet with an exaggerated knee-jerk. Unfortunately there are no autopsies to explain the seat of this lesion. However, in a number of these cases, there are also ataxic symptoms which would suggest that the postero-lateral columns are also involved. In other words, some of the cases suggest ataxic paraplegia. It may be that slight involvement of the postero-lateral columns in specific myelitis involving the pyramidal tracts accounts for the peculiar association of flacid paralysis with exaggerated knee-jerk.

Dr. G. Betton Massey.—A case seen by me some five years ago offers corroboration of Dr. Starr's remarks in two instances. The case was that of a lady who had sustained a fracture of the sixth or seventh cervical vertebra, exactly which one was not determined, as a post-mortem was declined. There was complete paralysis below the level of the shoulders, including the arms. She lived for ten months and died of intercurrent disease. Her condition five months after the accident was that of paralysis as mentioned; the arms were decidedly contractured, while below the level of the arms the paralysis was flacid. The reaction of degeneration was present throughout the paralyzed parts. There was also a hyperæsthetic area joining the paralyzed and healthy parts.

Dr. M. ALLEN STARR.—Brown Sequard paralysis presents one of the puzzles of neurology. It seemed to me in reading Head's paper, that possibly he might have found some explanation for the Brown-Sequard phenomena on the theory which he has developed so carefully of referred sensation. As I have pointed out, a patient who is totally anæsthetic below a certain line of the body feels a sensation produced in that anæsthetic area, not in the area where it is produced, but at a point in the hyperæsthetic zone above the zone of anæsthesia. It seems to me that it is not impossible that we may find some explanation of the Brown-Sequard phenomena in such erroneous conscious reference of sensations which come from another source.

Dr. Lloyd alluded to Golgi's observations showing that most of the fibres pass up the same side of the cord. Yet some of Golgi's stained sections show that there are many fibres that do cross the cord in the posterior part of the commissural portion of the cord. In the last edition of Kölliker's book, the decussating fibres are pretty well demonstrated. I do not think that we can doubt the existence of decussating fibres and sensory decussation in the posterior portion of the cord. The facts are well summarized by Marie, in his last book, in which he describes a number of cords examined after long standing amputation of certain limbs. In these cords ascending degeneration was found not only on the side of the amputation, but also in the other side in the posterior columns of the cord. This is shown in his diagrams of degeneration in the tracts of the cord.

The statement that I made with regard to the cervical sympathetic on the authority of Kraus, was that in lesions of the cervical sympathetic nerve in the neck, there were not only disturbances of the pupil, narrowing of the palpebral fissure and retraction of the bulb, but also unilateral sweating and flushing of the face, and that when there was lesion of the cilio-spinal centre in the cord, no flushing of the face nor sweating was present.

I do believe that movements are represented in the cortex, but it seems to me that the phenomena present in anterior poliomyelitis where individual muscles are picked out by the disease and atrophied, rather tends to the view that muscles are represented in the cord rather than movements. It does not seem to me that in anterior poliomyelitis you have a certain set of movements obliterated as you have in cortical lesions, and I would therefore make the distinction, that muscles are represented in the cord and movements in the brain.

With regard to Head's views; those with reference to herpes, I have been able to confirm, but those in regard to cutaneous hyperæsthesia from internal disease, I have been unable to confirm. Head holds, for instance, that in cancer of the stomach, there is pain not only in the region of the stomach, but also distinct cutaneous hyperæsthesia, which is limited to a definite area corresponding to the segment of the cord connected with the stomach. I have examined many cases of disease of the internal organs, but was not able to find a single instance in which there was the cutaneous hyperæsthesia described by Head.

Hysterogenic Zones.—Dr. Clozier, of Beauvais, France, concludes a work on hysterogenic zones as follows:

1. Hysteria is a reflex disease of stomachic origin.
2. Excitation of tne hysterogenic zones will certainly provoke a crisis, in all typical subjects.
3. Strong pressure applied to that point of the thorax against which the apex of the heart strikes, will instantly arrest the crisis.
4. The same result has been obtained by tickling the vault of the palate.
5. There are similar zones to be discovered in other portions of the body.
6. In recapitulation, and in fact, the attack or the crisis as well as hysteria itself are reflex states.
7. He does not admit that hysteria is caused and dependent upon multiple and undetermined causes.—*Gazette des Hôpitaux*, No. 114, 1893. F. H. P.